UNIVERSITY OF
PUERTO RICO RÍO
PIEDRAS CAMPUS
COLLEGE OF NATURAL
SCIENCES DEPARTMENT
OF PHYSICS

Title: University Physics for Science & Engineering Majors: Part I

Code: FISI 3171 (2023) Section OU1

Number of Credits: 4

Pre-requisites: MATH 3018 or MATH 3023-3024 (Pre-

Calculus) Co-requisite: FISI 3173 (Physics Lab I),

MATH 3151 (Calculus I)

Description
First part of a calculus-based introductory Physics course for majors, designed to give them a sound background in Classical Physics that prepares them well for taking upper-level Physics courses. It includes Kinematics; Newton's Laws; Work, Energy; Conservation of Energy; Collisions and Conservation of Momentum; Rotational Kinematics; Torque and Angular Momentum; Equilibrium; Waves and Sound. This course provides the tools for the students to develop: (1) a basic understanding of Classical Physics laws and their application; (2) proficiency with the mathematics used to solve Physics problems; (3) problem-solving skills and strategies; (4) ability to communicate in writing and orally their understanding of Physics concepts and their application to problem-solving.

Objectives
Through this course, the students will:

- Read the sections of the book corresponding to the topics of the course and attempt to solve problems before they are discussed in class, in order to bring specific difficulties and questions for class discussion.
- Solve Physics problems independently in order to apply and show their understanding of basic Physics laws discussed in class.
- Apply calculus concepts to the solution of Physics problems
- Practice and develop problem-solving skills and strategies shown in class and in the textbooks
- Be able to Communicate their understanding of Physics concepts and of its application: (1) Solve the assigned book problems in writing, detailing their reasoning; (2) participate in class by answering my questions when called upon

(Syllabus continuation: Physics I, FISI 3171(2022)

Course Content and Approximate Time Distribution**.** Usually, there are changes)

Week 1: Velocity, Acceleration, and graph analysis. **The Derivative**.
Week 2. One dimensional motion and the gravitational constant.
Week 3: Vectors; Projectiles; and relative velocities
Week 4: Working out Problems and review
Week 5: **Exam I** Friday, **Sept 8** Covering 8-9 classes (Chapters 1, 2 & 3)

Week 6: Newton's Laws: The Free Body Diagram; no friction; constant friction;
Week 7: Newton's Laws: Centripetal acceleration; F = -bv & exponential function.
Week 8: Kepler's Laws and Newton's Synthesis
Week 9: **Exam II** (Chapters 4,5 &6)

Week 10: Work and Energy Work-Energy Theorem, Spring
Week 11: Potential Energy and the Conservation of Energy
Week 12: Impulse, Collision; Conservation of Momentum
Week 13: Center of Mass: Point Masses; Continuous Matter $X_{CM} = (1/M) \int r\, dm$
the rocket problem;
Week 14. **Exam III** (Chapters 7,8 & 9)

Week 15: Rotational Kinematics Moment of Inertia ($I = \int r^2\, dm$)
Torque, Angular Momentum, and Applications of 2nd Law Rotational Kinetic Energy and conservation of energy.
Vector Angular Momentum
Finals: **Exam IV** (Chapters 10 & 11) as scheduled by the registrar

Instructional Strategies
The professor combines discussion, lectures, audiovisual materials, and demonstrations to convey the content of the course. Early in the semester, the students are assigned problem sets that give them experience in problem-solving and prepare them for the examinations. In these problem sets, the students have to detail in writing their reasoning and their application of Physics concepts. The class discussions and laboratories (PHYS 3173) are synchronized to ensure that the lab activities produce timely reinforcement of concepts discussed in class.

Minimum Required Facilities
Lecture room with audiovisual equipment and demonstration experiments available on request.

Student Evaluation
Four partial examinations (the final exam is the fourth) are given during the semester. The exams are 100 points each and (total points/4) x 0.85 = 85% of the grade. Four problem sets are also assigned, corresponding to the topics on each exam. They each are worth 25 points. The (total points)/4 x 0.15 = 15% of the grade. The students are expected to detail in writing their understanding and the reasoning applied in the solution of the problems, in addition to the mathematical steps. Each problem set is due the day of the corresponding exam.

Grading System

The overall score is determined by calculating the percentage of points obtained by the student. Grades are then assigned according to the standard curve: 100-90% = A, 89-80% = B, 79-70% = C, 69-60% = D, 59-0% = F. **Note: The exams' grade is usually curved according to the exam results.**

Bibliography

1. **Physics for Scientists & Engineers (volume I), Douglas C. Giancoli, Prentice Hall, 2008 Either 3rd of 4th edition(ISBN 0-13-227358-6) is the required text.**
2. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley, 2002
3. Physics for Scientists & Engineers, Raymond A. Serway, Saunders Publishing, 2002

Rights of Students with Disabilities

UPR complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act 1990 (ADA) and the Commonwealth of Puerto Rico Law 51. Students receiving services through Rehabilitación Vocacional must contact the professor at the beginning of the semester in order to plan for reasonable accommodation and any required support equipment according to the recommendations given by the Oficina de Asuntos para las Personas con impedimentos (OAPI) of the Dean of Students. Likewise, students with special needs that require some type of accommodation must contact the professor.

REASONABLE ACCOMMODATION The University of Puerto Rico complies with all federal, state and regulations concerning discrimination, including "The American Disabilities Act" (Law ADA) and Law 51 of the Commonwealth of Puerto Rico. Students receiving vocational rehabilitation services should contact the teacher at the beginning of the semester to plan for reasonable accommodation and necessary support equipment in accordance with the recommendations of the Office of Matters for Persons with Disabilities (OAPI) of the Dean of Students. A request for reasonable accommodation does not exempt the student from meeting the academic requirements of the course.

ACADEMIC INTEGRITY The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR General Student Regulations (Certification Num. 13, 2009-2010, of the Board of Trustees) states that "academic dishonesty includes, but is not limited to: fraudulent actions, obtaining grades or grades academics using false or fraudulent simulations, copying all or part of another person's academic work, plagiarizing all or part of another person's work, totally or partially copying another person's answers to the questions of an exam, making or getting another take in your name any oral or written test or exam, as well as help or facilitation for another person to incur such conduct.

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Dean of Students or the Compliance Coordinator with Title IX for guidance and / or filing a complaint.